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31. STUDIES ON THE CHAETOGNATHA OF THE INDIAN SEAS. PART VIII. ON THE OCCURRENCE OF *SAGITTA FEROX* DONCASTER AND *S. HEXAPTERA* D'ORBIGNY IN THE WATERS OFF VISAKHAPATNAM¹

During the course of our work on the plankton of the waters of the Visakhapatnam coast (1952-58), 16 species of Chaetognaths have already been reported to occur here (refer previous Parts I-VII). In the present note the occurrence of two more species namely *S. ferox* and *S. hexaptera*, recorded for the first time from the waters off Visakhapatnam, are dealt with.

Sagitta ferox Doncaster

There has been some confusion in the literature with regard to the proper identification of this species. As *S. ferox* bears a very close resemblance to *S. robusta* Doncaster, there have been attempts to synonymise the two species. Ritter-Zahony (1911) placed *S. ferox* as a synonym of *S. robusta* and similarly Burfield & Harvey (1926) merged the two species on the grounds of similarity of head armature. However, Thomson (1947) kept them separate and has recorded certain constant differences in body proportions and in the shape of seminal vesicles between the two species. Besides, in *S. robusta* the head and collarete are broader than in *S. ferox* and the former attains a larger size than the latter. Doncaster (1902), also, found similar differences between the two species occurring here as shown in the following table. For comparison 'Warren' material from Thomson (1947) is added just to show the range of variation in the species.

¹ Read at the seminar on 'Some Aspects of Plankton Research' held at Porto Novo in March 1964.

Tokioka (1956) recorded *S. ferox* from the central part of the Indian Ocean. In the waters of the Lawson's Bay it is present from February to May and occurs in fewer numbers than *S. robusta*.

	'Warren' material		Lawson's Bay material	
	<i>robusta</i>	<i>ferox</i>	<i>robusta</i>	<i>ferox</i>
Width ..	6.1-6.6	5.5-5.8	6.0-8.7	4.4-6.74
Width of head ..	9.4-11.4	7.7-8.3	8.3-10.0	8.7-12.0
Length of anterior fin ..	25.5-30.4	21.1-22.7	28.0-30.98	22.2-24.0
Length of posterior fin ..	25.4-30.8	25.0-27.8	26.3-28.5	26.8-27.7

NOTE. The measurements are percentages of the total length of the body.

S. hexaptera d'Orbigny, 1843

This is probably the largest species found in the present collection and has been obtained from the plankton during March to May, but absent in other months. The following are the average measurements of the adult specimens from this coast :

Maximum length	..	28 mm.	
Tail segment	..	17.9 to 21.3	(% total body length)
Width of the head	..	5.2 to 6.0	do.
Anterior fin	..	12.5 to 14.3	do.
Posterior fin	..	21.87 to 23.3	do.
Distance between anterior and ventral fins	..	13.0 to 14.6	do.
Percentage of posterior fin in front of tail septum	..	more than 60%	
Jaws	..	7.0 to 8.0	
Anterior teeth	..	2.0 to 4.0	
Posterior teeth	..	3.0 to 7.0	

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32. STUDIES ON THE CHAETOGNATHA OF THE
INDIAN SEAS. PART IX. DIURNAL VERTICAL
MIGRATION OF SOME SPECIES OF CHAETOGNATHA
IN THE WATERS OFF VISAKHAPATNAM¹

INTRODUCTION

Diurnal vertical migration of the planktonic organisms in the surface layers of the sea is a well known phenomenon. The works of Michael (1919), Russel (1931), and others have confirmed the occurrence of vertical migration and they attribute this phenomenon mostly to the effect of light on the plankton. More recently Moore *et al.* (1953) and Owre (1960) have established some relationship between the vertical distribution and temperature.

The present observations on the vertical migration of Chaetognatha are based on the analysis of 94 samples of plankton collected at hourly intervals both from the surface and at different depths during the drifting cruises Nos. 2, 7, and 31 conducted in the waters off the Visakhapatnam coast. A Nansen-type of closing net was used for vertical hauls of plankton. In the following account the vertical distribution of 4 species of Chaetognatha, namely *Sagitta enflata* Grassi, *S. neglecta* Aida, *S. serratodentata* Krohn, and *Pterosagitta draco* Krohn, is described (see Parts I-VIII for other details of distribution in space and time).

¹ Formed part of the Doctoral thesis submitted by the author to the Andhra University.